

# Stage Rigging, an Overview

Stage Rigging is one of the most important areas that a technician can learn about at the Auditorium. Rigging is an incredibly practical skill, and tool. At the same time it is the most inherently dangerous one. This rigging manual will cover 4 Areas: Safety, Equipment, Procedures and Terms & Definitions.

## Section 1: Safety

No where else in the Auditorium is it as important as it is in Rigging to know safety rules and follow these guidelines. Your safety is at stake, as well as those around you.

1. When operating a lineset yell, “**Heads up, line coming in.(going out)**” This informs everyone on stage to look up and pay attention to a lineset that is in motion.
2. If a rigging failure occurs, and the counterweight system runs out of control, **DO NOT ATTEMPT TO STOP A RUNNING ROPE.** If the system has failed it will be dangerously out of balance grabbing the operating line to try to stop it will most likely lift you rapidly off the ground and then promptly drop you to the deck again. This would be over a distance of up to 35’. This situation is called a **”runaway.”**
3. In a Runaway situation, yell “**Runaway, runaway, runaway!!!**” Run, do not walk, to the nearest safe location. Depending on your location, these are the safety locations:  
  
Down Stage Left Pinrail - Through door into the pit/catwalk access way.  
Up Stage Left Pinrail - Through Up Stage Left Crossover entrance.  
Down Stage Right - Through door into pit access way.  
Up Stage Right - Through Up Stage Right Crossover entrance.  
Up Stage Center - To Up stage center back wall.  
Center Stage or Down Stage Center - Onto Apron and into House.  
Operating Gallery 2 - Through Downstage door into Catwalk
4. **Never** leave a lineset unlocked with the safety ring off.
5. **Never** intentionally create an unbalanced situation. When loading for weight, load for balance, not for movement advantage in or out.
6. When re-weighting, pipe off the operating line.
7. When re-weighting and you are on the deck, wear a hard-hat.

8. When passing stage weight, **always** ask if the person you are handing off to, “Got it?” This insures that weights will not be dropped.
9. Do not operate a lineset without a clear sight line to it, and the stage floor beneath it.
10. Do not operate a lineset with someone under it.
11. During re-weighting operations, call “**Loading Arbor!**” if you are in the loading gallery. Deck hands will respond with a “**Clear!**” when they are clear of the Pinrail. Loaders will call “**Loading Clear!**” when they are done. Deck hands will call “**Running Set!**” when they are prepared to test the new weight.
12. If you are uncomfortable going into the galleries, operating a set, re-weighting, inform the Auditorium Manager. He will make sure that you are not in a situation where you feel at risk.
13. During all rigging operations, there will be no music or distractions on stage. This leads to dangerous situations.
14. When operating a set, if you meet resistance, do not attempt to pull through it. Back off and attempt to run the line again. If hard resistance or a jam occurs, inform the Auditorium Manager immediately.
15. **Never** attempt to fly in electric’s to the floor without checking pick lines first.
16. **Never** fly in orchestra shell pieces without first clearing all legs to the offstage ends of their battens.
17. **Never** attempt to bring in the orchestra shell alone.
18. **Never** wrap a coil of rope around your arm for leverage. If load slips your arm could be dislocated or removed depending on the load.
19. If travelling or flying a piece, and it suddenly stops or you feel resistance suddenly add on to the move, STOP. This means the lineset, or curtain has gotten hung up on something. Trying to pull through the resistance can tear a curtain, damage equipment and possibly result in injury or death.

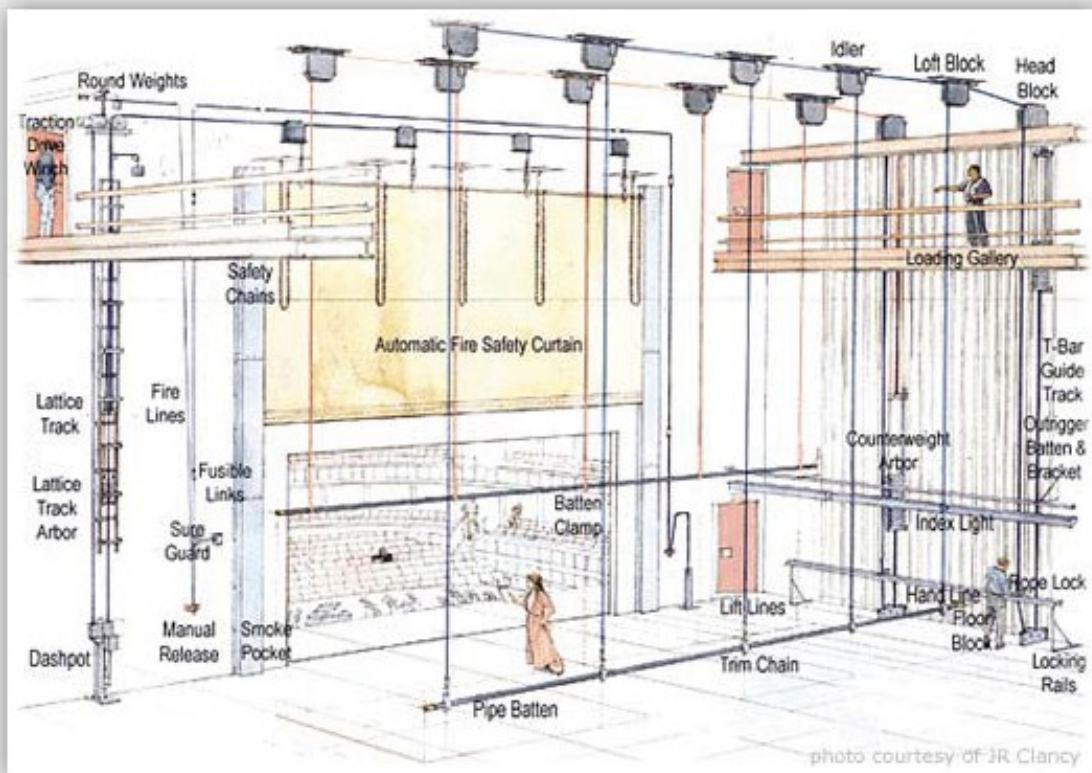
## **Gravity**

This manual, unlike the others, does not really go into some of the theory of rigging. Theory in rigging is based, most simply on gravity, and mechanical advantage. Important physical laws have very real applications here. Remember; **Bodies in motion tend to stay in motion, and bodies at rest tend to stay at rest.** What stops a moving body is

**friction.** Bodies in motion have **inertia.** The most important thing to remember is, of course; **What goes up, must come down.** The basics of these principles, how they are calculated, and such can fill an entire text book. If rigging really fascinates you, find out more about the valuable work of Sir Isaac Newton, and take a physical science class.

## Section 2: Equipment

**The Counter Weight System.** The majority of rigging we will be doing is centered around our counter weight system. The system itself is a **single purchase** counter weight system. Single purchase means there is one rope that is connected directly to the **arbor.** An Arbor is the metal carriage that carries the counter weights. There are three types of arbors in the system; 7' arbors (carrying up to 1,300 lbs of stage weight), 10' arbors (carrying up to 2,000 lbs of stage weight), and 12' arbors. Even foot arbors are used for most scenery. Ten foot arbors are used for lighting. Twelve foot arbors are used exclusively for the orchestra shell.



The system is designed so that a scenic piece (curtain, set, person, etc.) is connected to a **batten.** The batten is connected to the arbor by **lift lines.** The Lift lines pass over a **loft block,** which is a pulley, the line then runs over the **head block** which is at the top of the pinrail. The lines are then connected to arbor. The arbor is then connected to **hand line,** or purchase line. It is this rope that an operator uses to lift the entire system. When properly balanced, an operator will have to exert roughly up to 30 pounds of lifting/pulling force on the line to get it started. It then should run smoothly.

At the purchase line, there is a **lock rail**. The purchase line runs through the lock rail. When closed, the lock holds the lineset in place. Locks are only designed to hold roughly 40 pounds of weight. Do not rely on a lock to hold a piece that is severely out of weight.

Looking into the fly pit, you see a pulley at the bottom. This is the **tension block**. The tension block is used to adjust the tension in the purchase line. This is done by moving the block in the **t-track** that it is mounted in. The t-track is the metal guide that the arbor also runs in.

### **Curtains**

There are three kinds of curtains used in Auditorium. They are **borders, legs, and travelers**.

**Borders** are the horizontal curtains that are general used to hide rigging and lights. They are also known as **teasers**. The first border that is by the main curtain is known as the **valance**.

**Legs** are the vertical curtains that frame the sides of the stage and hide the backstage areas. They are also known as **tormentors**. The legs are hung on devices called **roto-drapers**. Roto drapers allow an operator to twist the legs to create new looks. To move a legs back and forth or to twist it, there is a black hand line that runs down behind each leg. Grab the hand line and one edge of the curtain. Pull with an easy constant pressure, do not pull in a hard tug.

**Travelers** are vertical curtains like legs, that close horizontally across the stage to close it off. The front curtain, also known as the **main** or **grand** is a traveler. We have one other traveler that we can move to different positions on stage. The position of the curtain onstage dictates it's name. If it is a far down stage position it is called a **1/4 or quarter traveler**. At mid stage it is called a **1/2 or half traveler**. Upstage it is called a **3/4 or three quarter traveler**. These names relate to 1/4 of the stage, 1/2 of the stage, or 3/4 of the stage available to perform on.

### **Pick lines**

Not part of the counter weight system are the pick lines connected to the electric's. The pick lines are a rope set that are connected to the power cables of the electric's. The pick lines are holding the extra cable out of the way to dress the stage neatly. If these are tied off, and the electric is attempted to be flown in, these pick lines will prevent that. Therefore **they must be released before the electric's can be flown in**. They are tied off to a pin on the stage right pin rail.

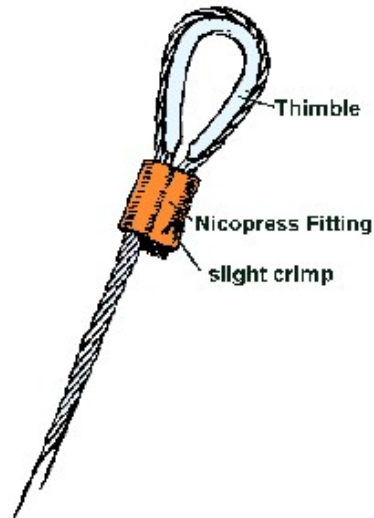
### **The Orchestra Shell**

The Orchestra Shell is used to enhance the acoustics of the stage by creating a ceiling over the stage. Each shell piece weighs roughly a **ton and a half**. They are very heavy and should not be operated by one person. When brining in an orchestra shell piece, make sure that all legs have been trimmed to their far offstage positions. Special rules

about the main curtain also apply when using the shell, see the procedures section for more details.

### **Wire Rope Attachment**

When we fly scenery, it will be done with wire roped connected to the scenery. There are two basic ways to do this, with slightly different equipment used in both applications.



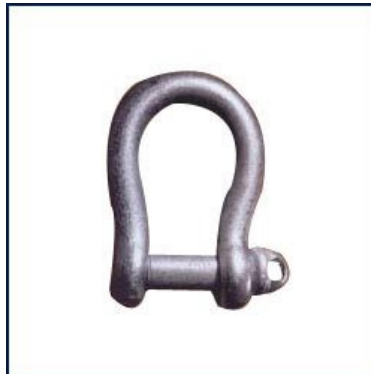
**Nicopress** is a metal sleeve that fed over the cable and then crimped locked. Nicopress termination's keep 100% of the integrity and strength of the cable intact. Nicopress terminations are the preferred way to create ends on aircraft cable for overhead flying operations.



**Cable Clips** or **Crosbies** are the alternate method. Crosbies are named for the company that manufactures the best ones for rigging applications. Not all cable clips are rated for rigging and lifting operations. Crosbies are rated for lifting operations.



**Thimbles** are the metal loops that cable or rope is fed around to make a clean loop around a pick point. Thimbles are used to prevent wear on ropes and lines.



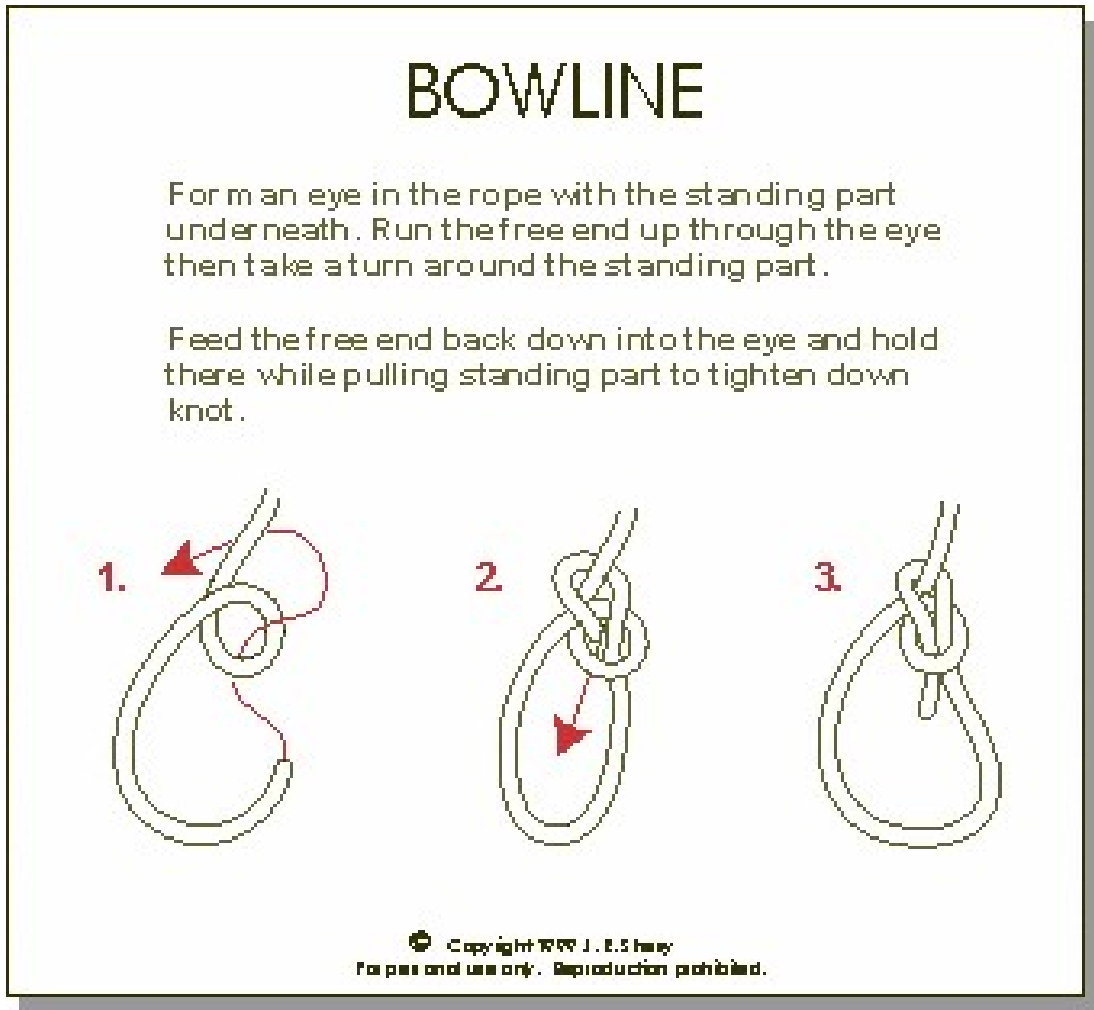
**Shackles** are U shaped pieces of metal that are used for connecting and locking chain together. A pin screws into the shackle. Not all shackles are rated for lifting operations.



**Turn Buckles** are devices that are used for adjusting tension at a connection point.

## Knots

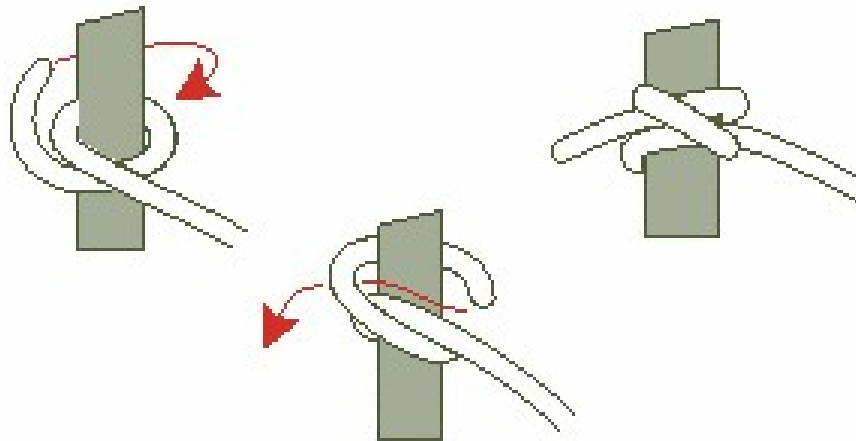
Knots are very important to rigging. It must be remembered that every time a knot is tied, it reduces the breaking strength of rope, some knots can reduce the breaking strength of a rope by up to half or more. That is the reason we will be relying on wire rope and clip termination for most rigging applications. However some knots are very useful to know.



**Bowline** is used when tying a loop in the end of a rope. It is the single most useful knot to use in the Theatre.

# CLOVE HITCH

Make a turn around a post with the standing part on the top. Take a second turn around in the same direction and feed the free end through the eye of the second turn. Pull tight.



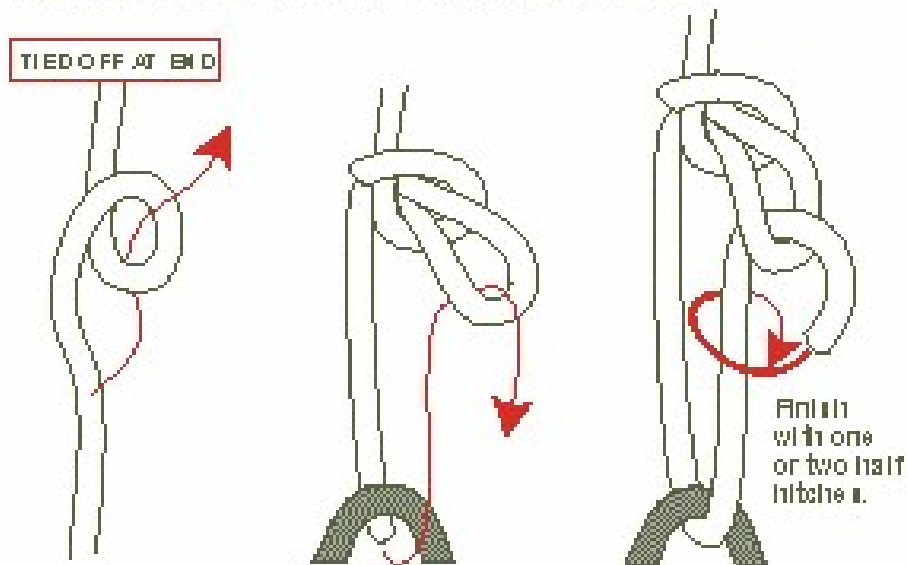
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**Clove Hitch** is used for tying a rope to a rigid solid object, such as a batten. When tied properly, it does not slip sideways.



# TRUCKER'S HITCH

Tie off one end of rope. Tie a slippery half hitch in the middle of the line to form a small loop. With free end, make a half turn around a fitting and bring the free end back up to the loop. Feed through and pull line tight. Finish off with one or two half hitches.



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**Truckers Hitch** is useful when tying down or securing scenery and or equipment.

## Section 3: Procedures

### Reweighting the Counterweight System

#### Adding Weight / Scenic Pieces

1. Fly batten to floor (or as low as possible.)
2. Lock off **both** locks. (On deck and in the 2nd Pinrail.)
3. Purchase line is twisted off with pipe, pipe is inserted into t-track. Rope is now “piped off.”
4. Clear floor crew from Pinrail.
5. Scenic piece is attached to batten. Batten is now batten heavy and will fly out.
6. Loaders in loading gallery / 2nd Pinrail add stage weights.  
(At this time the arbors become batten heavy and will not start to try to lift the piece.) Rule of thumb: A drop weighs 3 1/2 weights. For every two lights, three stage weights are needed. Spreader plates are added every two weights.
7. Floor crew returns to Pinrail.
8. Piped off rope is released.
9. Locks on Pinrail are released.
10. Batten is flown out to test weight. Batten and arbor are flown so they are level with one another. If weighted properly, they will stay balanced.
11. Piece is flown back in to adjust weight (if needed.) Repeat steps until piece is balanced and operates easily.

#### Removing Weight / Scenic Pieces

1. Fly batten to floor (or as low as possible.)
2. Lock off **both** locks. (On desk and in the 2nd Pinrail.)
3. Purchase line is twisted off with pipe, pipe is inserted into t-track. Rope is now “piped off.”
4. Clear floor crew from Pinrail.
5. Loaders in loading gallery / 2nd Pinrail remove stage weights.(At this time the piece become batten heavy and will not leave the floor.)

6. Arbor is struck of weight down to red weights. (Pipe weight or arbor weight.)
7. Scenic piece is removed from batten. Batten is now at empty, batten weight.
8. Floor crew returns to Pinrail.
9. Piped off rope is released.
10. Locks on Pinrail are released.
11. Batten is flown out to grid.

### **Show Operation**

#### **Preshow -**

Pieces are flown to make sure they are moving properly, and smoothly.

#### **During Show -**

All pieces will spiked in and out positions. Cues are taken on the "GO" from headset. Operators will move pieces at safe operating speeds so they can hit their spikes.

#### **Post Show -**

All pieces are flown out to store in the loft space so the deck can be cleaned if needed.

### **Orchestra Shell**

#### **Installation**

1. Pull all legs to extreme off stage positions.
2. Fly ceilings furthest downstage pieces in. Ceiling bottom should be 6" off of deck. Use Pinrail locks to lock off unit.
3. Remove locks on back of unit. Start in the center and move out left and right.
4. Three deck hands, one center, one stage left, one stage right, tilt the ceiling forward until locks catch.
5. Slowly fly piece out to trim height. Trim height is determined by main curtain usage. If main is not used, it is roughly four feet below proscenium top. If main is used, down stage edge of ceiling is trimmed to top of proscenium.

6. Repeat steps 2 through 5 for remaining pieces that are needed. As other ceilings are flown out to trim position, go slow so not to run into another ceiling. Other ceiling trim heights are level with the upstage edge of the next downstage unit.
7. Trim legs so they are even with the offstage edges of the ceilings.
8. Move floor acoustic panels onto spikes on floor of upstage cove to create upstage wall.

### **Removal**

1. Pull all legs to extreme off stage positions.
2. Fly ceilings furthest upstage piece in. Ceiling bottom should be 4' off of deck. Use Pinrail locks to lock off unit.
4. Three deck hands, one center, one stage left, one stage right, tilt the ceiling down by the upstage edge until ceiling is vertical.
3. Lock braces over arms. Start in the center and move out left and right.
5. Slowly fly piece out to grid. Be sure not to slam other scenic pieces or get hung upon curtain as piece flies.
6. Repeat steps 2 through 5 for remaining pieces that are needed.
7. Trim legs so they are even with the offstage edges of the ceilings.

### **Traveling**

1. Screw or attack floorblock to deck.
2. Travel piece in and set spikes. Spikes should be set on each rope so that there are level with each other. Different positions (In and out) should be spiked with different colors.
3. Execute cue on headset "GO".

### **Lighting Baton Pick Line Trims (Operating Galleries only)**

1. Free coil of rope on nearby pin.
2. Remove belayed rope except for one turn on the Pinrail.
3. Use pin as a pulley to raise or lower pick line.

4. Tie line off with a double figure eight around both pins, followed by a hitch on the top of the pin. A second safety hitch on the top of the pin can also be applied.

### **Hanging Drops**

1. Find Centerline mark on drop.
2. Find centerline on batten.
3. Multiple stage hands carry drop in their arms under batten.
4. Starting from center, tie drop to batten.
5. After drop is tied return to center.
6. Pull all ties offstage as far as they will go working from the center out.

### **Rope Maintenance**

1. Never step on a rope.
2. Never coil a rope over your arm. Use the under/over cable technique.

## **Section 6: Terms & Definitions**

Unit	Definition
Arbor	Carriage that holds stage weights.
Batten	Pipe that scenery and drops are tied to.
Border	Horizontal curtain that masks lighting and rigging.
Bowline	Type of knot used for tying a loop.
Cable Clip	Metal clip used for securing wire rope.
Clove Hitch	Type of knot used for tying onto a batten.

Crosby	See Cable Clip
Dead Hung	Piece that does not have to fly in and out, but is tied stationary to the grid.
Full Weight	Stage Weight that weighs 35 lbs.
Grand	Front curtain.
Gridiron	Metal grid that all rigging is “attached” to.
Half Weight	Stage weight that weighs 17 lbs.
Head Block	Point above arbor where lift lines go out across stage.
Leg	Vertical curtain used for masking backstage and sets.
Lineset	An entire line of the counter weight system. Refers to everything from batten back to the lock rail.
Lock Rail	Lock on purchase line used for holding purchase line in place.
Loft Block	Point above stage where lift lines transfer from batten to offstage.
Main	See Grand
Pick Line	Rope used to guide a scenic piece. Used at Auditorium for power lines running to electrics.
Purchase Line	Or hand line. Rope used to operate a lineset.
Runaway	Situation that occurs when counter weight system fails. Scenery, arbors and battens will be moving out of control.

Shackles	Metal clips used to attach chain.
Single Purchase	Type of Counter weight system where purchase line connects directly to arbor.
T-Track	Metal track that arbors and tension blocks ride in.
Teaser	<b>See Border</b>
Tension Block	Point used to adjust tension on purchase line.
Thimble	Metal loop used for wire rope and hemp rope. Prevents wear on rope at a turn around.
Tormentor	<b>See Legs</b>
Traveler	Curtain that moves horizontally across stage, closing it off.
Turn Buckles	Devices used for adjusting tension on hung pieces.

Revised 9/10/13